

**REMARKS**

The applicant respectfully requests reconsideration in view of the amendments and the following remarks. The applicant has amended the claims to overcome the 35 U.S.C. 112, second paragraph rejection.

Claims 1-17 are rejected under 35 U.S.C. 112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claims 1-17 are rejected under 35 U.S.C. 102(b) as being anticipated by WO 1999/38824, as evidenced by counterpart U.S. Patent No. 6,355, 848 to Antons et al. (“Antons”). Claims 1, 5 and 7-17 are rejected under 35 U.S.C. 102 (a) as being anticipated by WO 2004/022522, as evidenced by U.S. Patent No. 7,217,847 to Fischer et al. (“Fischer”). Claims 1, 5 and 7-17 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 7-12 of copending Application No. 10/534,457 (“‘457 application”). Claims 1-15 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-15 of copending Application No. 10/513, 040 (“‘040 application”). Claims 1-17 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-18 of U.S. Patent No. 6,831,182 (“182 patent”). The applicant respectfully traverses these rejections.

**35 U.S.C. 112 Second Paragraph Rejection**

Claims 1-17 are rejected under 35 U.S.C. 112, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The applicant has amended the claims to overcome the 35 U.S.C. 112, second paragraph rejection. For the above reasons, this rejection should be withdrawn.

**35 U.S.C. 102(b) Rejection Over Antons**

Claims 1-17 are rejected under 35 U.S.C. 102(b) as being anticipated by Antons. Antons is cited in the applicant’s specification at page 1, lines 33-36.

Antons discloses catalysts comprising ruthenium (Ru) and at least one further metal or transition metal having an atomic number in the range from 23 to 82. This would comprise catalysts comprising ruthenium (Ru) and rhenium (Re). Those catalysts are excluded from the definition of pending claim 1 of the present application by proviso a). Therefore, the claims are not anticipated over Antons. For the above reasons, this rejection should be withdrawn.

**35 U.S.C. 102 (a) Rejection Over Fischer**

Claims 1, 5 and 7-17 are rejected under 35 U.S.C. 102 (a) as being anticipated by Fischer. Fischer discloses catalyst comprising palladium (Pd) and rhenium (Re) or platinum (Pt) and rhenium (Re) or in other words rhenium (Re) and palladium (Pd) or platinum (Pt). Those specific embodiments were carved out of the protection scope of claim 1 by proviso b). Therefore the claims are not anticipated over Fischer. For the above reasons, this rejection should be withdrawn.

**Double Patenting Rejections**

Claims 1, 5 and 7-17 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 7-12 of copending Application No. 10/534,457. Claims 1-15 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-15 of copending Application No. 10/513,040. Claims 1-17 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-18 of U.S. Patent No. 6,831,182.

Obviousness-type double patenting as defined is when claims in a patent application are not patentably distinguishable from claims in a patent (MPEP 804). The test applied to determine obviousness-type double patenting exists is whether or not the claims in the application define merely an obvious variation of the invention disclosed and claimed in the

patent (In re Vogel and Vogel, 164 USPQ 619 (CCPA 1970). If claims are unobvious over 35 U.S.C. §103, there can be no double patenting (In re White and Langer, 160 USPQ 417 (CCPA 1969)). There is no overlapping claimed subject matter in these references with this application.

The '457 Application claims:

Claim 1: A catalyst comprising from 0.1 to 20% by weight of rhenium and from 0.05 to 10% by weight of platinum, based on the total mass of the catalyst, on a support, obtainable by a process comprising:

- a) treating the support with a solution of a rhenium compound;
- b) drying the treated support, and then heat treating the dried support in a reductive atmosphere at from 80 to 600°C thereby forming a catalyst blank; and
- c) impregnating the catalyst blank with a solution of a platinum compound and then drying.

Claim 2: A catalyst according to claim 1, wherein the support is selected from the group consisting of: a metal oxide; optionally pretreated activated carbon; optionally pretreated graphitic carbon; a nitride; a silicide; a carbide; and a boride.

Claim 3: A catalyst according to claim 2, wherein the support is selected from the group consisting of: titanium dioxide; zirconium dioxide; hafnium dioxide; optionally pretreated activated carbon; and optionally pretreated graphitic carbon.

Claim 4: A catalyst according to claim 1, wherein the reductive atmosphere comprises at least a portion of at least one gaseous material selected from the group consisting of gaseous ammonia, hydrazine, C<sub>2</sub>- to C<sub>6</sub>-olefin, carbon monoxide, and hydrogen.

Claim 5: A catalyst according to claim 1, wherein, after step b), the catalyst blank obtained is passivated with an oxygenous gas.

Claim 6: A catalyst according to claim 1, which is activated by using a reducing gas atmosphere or a liquid reducing agent.

Claim 7: A process for preparing an alcohol by catalytically hydrogenating a carbonyl compound to an alcohol, which comprises using a catalyst according to claim 1.

Claim 8: The process according to claim 7, wherein the carbonyl compound is at least one compound selected from the group consisting of aldehydes, carboxylic acids, esters, anhydrides, and lactones.

Claim 9: The process according to claim 8, wherein the carbonyl compound is selected from the group consisting of maleic acid, fumaric acid, succinic acid, esters thereof, anhydrides thereof, and gammabutyrolactone; and is hydrogenated to 1,4-butanediol.

Claim 10: The process according to claim 9, wherein the carbonyl compound is selected from the group consisting of adipic acid, 6hydroxycaproic acid, esters of said acids, caprolactone; and is hydrogenated to 1,6-hexanediol.

Claim 11: The process according to claim 7, wherein the catalytically hydrogenating is carried out in the liquid phase over the catalyst in solid form at a pressure in the range from 20 to 230 bar and a temperature in the range from 80 to 210°C.

Claim 12: The process according to claim 7, wherein a hydrogenation reactor charged with the catalyst is started up under hydrogenation conditions using water or a dilute aqueous solution of the carbonyl compound.

Claim 13: The catalyst according to claim 2, wherein the reductive atmosphere comprises at least a portion of at least one gaseous material selected from the group consisting of gaseous ammonia, hydrazine, C<sub>2</sub>- to C<sub>6</sub>-olefin, carbon monoxide, and hydrogen.

Claim 14: The catalyst according to claim 3, wherein the reductive atmosphere comprises at least a portion of at least one gaseous material selected from the group consisting of gaseous ammonia, hydrazine, C<sub>2</sub>- to C<sub>6</sub>-olefin, carbon monoxide, and hydrogen.

Claim 15: The catalyst according to claim 2, wherein, after step b), the catalyst blank obtained is passivated with an oxygenous gas.

Claim 16: The catalyst according to claim 3, wherein, after step b), the catalyst blank obtained is passivated with an oxygenous gas.

Claim 17: The catalyst according to claim 4, wherein, after step b), the catalyst blank obtained is passivated with an oxygenous gas.

Claim 18: The catalyst according to claim 2, which is activated by using a reducing gas atmosphere or a liquid reducing agent.

Claim 19: The catalyst according to claim 3, which is activated by using a reducing gas atmosphere or a liquid reducing agent.

Claim 20: The catalyst according to claim 4, which is activated by using a reducing gas atmosphere or a liquid reducing agent

The '457 application claims a catalyst containing rhenium and platinum. This is excluded from the applicant's claimed invention (see proviso b of claim 1). Further, the '457 application does not explicitly claim the preparation of optically active alcohols by hydrogenation of the corresponding optically active compounds. There is clearly no overlap in the claimed inventions. For the above reasons, this rejection should be withdrawn.

The '040 application claims:

Claim 1: A process for preparing unsubstituted or C<sub>1</sub>-C<sub>4</sub>-alkyl-substituted gamma-butyrolactone by catalytic hydrogenation of maleic acid and/or its derivatives in the presence of chromium-free catalyst comprising from 10 to 80% by weight of copper oxide, up to 50% by weight of at least one metal or metal compound of elements of groups 1 and 2 of the Periodic Table of the Elements and/or the rare earth metals including the lanthanides and from 10 to 90% by weight of at least one catalyst support selected from the group consisting of silicon dioxide, titanium dioxide, hafnium dioxide, magnesium silicate, activated carbon, silicon carbide, zirconium dioxide and alpha-aluminum oxide.

Claim 2: A process as claimed in claim 1, wherein the catalyst further comprises up to 10% by weight of one or more further metals or compounds thereof selected from the group consisting of silver, molybdenum, tungsten, manganese, rhodium, ruthenium, rhenium, palladium and platinum.

Claim 3: A process as claimed in claim 1 carried out at pressures of from 1 to 30 bar.

Claim 4: A process as claimed in claim 1, wherein the molar ratio of hydrogen/starting material is in the range from 20 to 600.

Claim 5: A process as claimed in claim 1, wherein the gas hourly space velocity (GHSV) is in the range from 100 to 20,000 standard m<sup>3</sup>/m<sup>3</sup>h.

Claim 6: A process as claimed in claim 1, wherein the inlet temperature is in the range from > 180 to 300°C.

Claim 7: A process as claimed in claim 1, wherein the catalyst is activated by reduction, before or after it is installed in the reactor and before it is used in the hydrogenation reaction.

Claim 8: A process as claimed in claim 1, wherein the catalyst contains an auxiliary in an amount of < 10% by weight.

Claim 9: A process as claimed in claim 1, wherein the shaped catalyst body has a pore volume of  $\geq 0.01$  ml/g for pore diameters of  $> 50$  nm.

Claim 10: A process as claimed in claim 1, wherein the ratio of macropores having a diameter of  $> 50$  nm to the total pore volume for pores having a diameter of  $> 4$  nm in the shaped catalyst body is  $> 10\%$ .

Claim 11: A process as claimed in claim 1, wherein maleic anhydride which has been prepared by oxidation of benzene, C<sub>4</sub>-olefins or n-butane is used, where the crude maleic anhydride obtained by oxidation has been extracted from the crude product mixture by means of a solvent and has subsequently been stripped from this solvent by means of hydrogen.

Claim 12: A process as claimed in claim 2, which comprises from 0.1 to 10% by weight of the one or more further metals or compounds thereof.

Claim 13: A process as claimed in claim 1, wherein the catalyst consists essentially of from 10 to 80% by weight of copper oxide, up to 50% by weight of at least one metal or metal compound of elements of groups 1 and 2 of the Periodic Table of the Elements and/or the rare earth metals including the lanthanides, up to 10% by weight of one or more further metals or compounds thereof selected from the group consisting of silver, molybdenum, tungsten, manganese, rhodium, ruthenium, rhenium, palladium and platinum, from 10 to 90% by weight of at least one catalyst support selected from the group consisting of silicon dioxide, titanium dioxide, hafnium dioxide, magnesium silicate, activated carbon, silicon carbide, zirconium dioxide and alpha-aluminum oxide, and optionally an auxiliary in an amount of < 10% by weight.

Claim 14: A process as claimed in claim 7, wherein the catalyst is activated by treatment with hydrogen or a hydrogen/inert gas mixture.

Claim 15: A process as claimed in claim 8, wherein the auxiliary is graphite, stearic acid, silica gel and/or copper powder.

The '040 application claims a process for producing gamma-butyrolactones by catalytic hydrogenation of maleic acid in the presence of a chromium-free catalyst comprising copper oxide and up to 90% of a catalyst support. The '040 is clearly regarded as patentably distinct from the present invention. For the above reasons, this rejection should be withdrawn.

The '182 patent claims:

1. A process for the gas-phase hydrogenation of C<sub>4</sub> -dicarboxylic acids or their derivatives over a catalyst based on copper oxide to give substituted or unsubstituted  $\gamma$ -butyrolactone and/or tetrahydrofuran, which comprises a first reaction zone in which the C<sub>4</sub> -dicarboxylic acid and/or its derivatives is/are reacted to give a mixture comprising a substituted or unsubstituted  $\gamma$ -butyrolactone as main product and a subsequent second reaction zone in which the substituted or unsubstituted  $\gamma$ -butyrolactone present in the mixture from the first hydrogenation step is reacted at a temperature lower than the temperature in the first hydrogenation step to give substituted or unsubstituted tetrahydrofuran.
2. A process as claimed in claim 1, wherein the catalyst comprises from 5 to 100% by weight of copper oxide and from 0 to 95% by weight of one or more metals or their compounds selected from the group consisting of Al, Si, Zn, La, Ce, the elements of groups IIIA to VIIIA and groups IA and IIA as active composition.
3. A process as claimed in claim 1, wherein the reaction in the first zone is carried out at  $\geq 200^{\circ}\text{C}$  and the reaction in the second zone is carried out at  $\leq 280^{\circ}\text{C}$ .
4. A process as claimed in claim 3, wherein the reaction in the first zone is carried out at from 230 to 300°C and the reaction in the second zone is carried out at from 150 to 240°C.
5. A process as claimed in claim 1, wherein the catalysts used in the two reaction zones have the same composition.
6. A process as claimed in claim 1, wherein the catalysts used in the two reaction zones have different compositions.
7. A process as claimed in claim 1, wherein the catalyst used in the first reaction zone comprises from 5 to 100% by weight of CuO, from 0 to 80% by weight of ZnO and from 0 to 95% by weight of Al<sub>2</sub>O<sub>3</sub> and the catalyst used in the second reaction zone comprises from 5 to 80% by weight of CuO, from 0 to 80% by weight of ZnO and from 0 to 60% by weight of Al<sub>2</sub>O<sub>3</sub>.
8. A process as claimed in claim 7, wherein the catalyst in the first reaction zone comprises from 20 to 80% by weight of CuO, from 10 to 40% by weight of ZnO and from 5 to 60% by weight of Al<sub>2</sub>O<sub>3</sub>, and the catalyst in the second reaction zone comprises from 20 to 60% by weight of CuO, from 0 to 60% by weight of ZnO and from 10 to 50% by weight of Al<sub>2</sub>O<sub>3</sub>.
9. A process as claimed in claim 1, wherein both reaction zones are accommodated in a reactor which is not operated isothermally and in which the temperatures are set so that the temperature in the first reaction zone is higher

than that in the second reaction zone.

10. A process as claimed in claim 1, wherein the pressures set in the two reaction zones are, independently of one another, from 0.5 to 100 bar.

11. A process as claimed in claim 10, wherein the pressures are from 1 to 50 bar.

12. A process as claimed in claim 10, wherein the pressures are from <20 bar.

13. A process as claimed in claim 1, wherein maleic anhydride is used as starting material.

14. A process as claimed in claim 13, wherein the maleic anhydride concentration in the first reaction step is from 0.1 to 5% by volume.

15. A process as claimed in claim 14, wherein the concentration is from 0.2 to 3% by volume.

16. A hydrogenation process as claimed in claim 1, wherein the first and second reactions are carried out, independently of one another, in a tube reactor, a shell-and-tube reactor or a fluidized-bed reactor.

17. A process as claimed in claim 1, wherein the catalyst comprises from 5 to 100% by weight of copper oxide and from 0 to 95% by weight of one or more metals or their oxides selected from the group consisting of Al, Si, Zn, La, Ce, the elements of groups IIIA to VIIIA and groups IA and IIA as active composition.

18. A process as claimed in claim 1, wherein the reaction in the first zone is carried out at from 230 to 300°C, and the reaction in the second zone is carried out at from 150 to 240°C.

The '182 patent claims a process for the gas-phase hydrogenation of C<sub>4</sub>-dicarboxylic acids over a catalyst based on copper oxide. There is no overlap with the claims of the '182 patent and the process of the present invention. For the above reasons, this rejection should be withdrawn.

In view of the above amendment, applicant believes the pending application is in condition for allowance.

Applicant believes no fee is due with this response. However, if a fee is due, please charge our Deposit Account No. 03-2775, under Order No. 12810-00338-US from which the undersigned is authorized to draw.

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Respectfully submitted,

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